

WHAT IS CLAIMED IS:

1. A position detection method for detecting the position of an object upon receiving light from a plurality of position detection marks on the object,
5 comprising:
 - an image information acquisition step of obtaining image information of every position detection mark from the light that has been received;
 - a position information calculation step, which
10 has a plurality of calculation processes, of calculating position information of every position detection mark from the image information using a prescribed calculation process among the plurality of calculation processes;
 - 15 an error information calculation step of calculating information representing an error of a position detection mark, which corresponds to each item of the position information, with respect to a reference position;
 - 20 a residual-error information calculation step of calculating information representing a residual error that is the result of eliminating a prescribed error component from the information representing the error;
 - a storage step of obtaining, for each item of the
25 position information, a calculation process, from among the plurality of calculation processes, for calculating pertinent position information that will

minimize the residual error, and storing a combination of this position information and calculation process that corresponds thereto; and

a position detection step of detecting the
 5 position of the object using information representing an error calculated based upon the combination of the position information and the calculation process that corresponds thereto.

2. The method according to claim 1, wherein if x and
 10 y directions are taken as mutually orthogonal directions having the reference position as the origin thereof, the information representing the error is represented, as a deviation in the position of the position detection mark from the reference position,
 15 by shift S_x in the x direction, shift S_y in the y direction, inclination θ_x with respect to the x axis, inclination θ_y with respect to the y axis, magnification B_x along the x direction and magnification B_y along the y direction, and the
 20 prescribed error component is obtained in accordance with the following equation:

$$D'i = \begin{pmatrix} B_x & -\theta_y \\ \theta_x & B_y \end{pmatrix} Di + \begin{pmatrix} S_x \\ S_y \end{pmatrix}$$

3. The method according to claim 1, wherein said storage step obtains a calculation process for which
 25 the mean sum of the squares of the residual error will be minimized.

4. The method according to claim 1, wherein the plurality of calculation processes calculate the position information by matching image information with a template that exhibits maximum correlation from
5 among a plurality of different templates.
5. The method according to claim 4, wherein the image information includes image information having two minimal values conforming to both ends of a position detection mark and image information having a minimal
10 value only in the vicinity of the center of the single position detection mark, a template conforming to each item of image information being provided.
6. The method according to claim 1, wherein the template has a plurality of templates having symmetry
15 in relation to direction in which the position detection mark is detected.
7. The method according to claim 1, wherein the calculation processes include any two or more of a method of matching image information with the
20 template, a method of calculating position information from centroid-position information of pixels in the image information, and a method of calculating position information from a differential value of the image information.
- 25 8. A position detection apparatus for detecting the position of an object upon receiving light from a plurality of position detection marks on the object,

comprising:

an image information acquisition unit for obtaining image information of every position detection mark from the light that has been received;

5 a position information calculation unit, which has a plurality of calculation processes, for calculating position information of every position detection mark from the image information using a prescribed calculation process among the plurality of
10 calculation processes;

an error information calculation unit for calculating information representing an error of a position detection mark, which corresponds to each item of the position information, with respect to a
15 reference position;

a residual-error information calculation unit for calculating information representing a residual error that is the result of eliminating a prescribed error component from the information representing the error;

20 a storage unit for finding, for each item of the position information, a calculation process, from among the plurality of calculation processes, for calculating pertinent position information that will minimize the residual error, and storing a combination
25 of this position information and calculation process that corresponds thereto; and

a position detection unit for detecting the

position of the object using information representing an error calculated based upon the combination of the position information and the calculation process that corresponds thereto.

- 5 9. An exposure apparatus having a stage device driven in order to position the object based upon position information detected by the position detection apparatus set forth in claim 8;

 said stage device positioning a substrate or a
10 reticle or both as the object.